

## TRANSIT OF VENUS.

THE OBSERVATIONS IN SIBERIA.

PHOTOGRAPHS OF VENUS.

The Planet's Track Mapped at Vladivostok.

TRIUMPHS OF AMERICAN INGENUITY.

Work of the Foreign Expeditions.

THE DIAGRAMS EXPLAINED.

The Great Problem Drifting Toward a Definite Solution.

PROFESSOR HALL'S PARTY.

WASHINGTON, Feb. 14, 1875.

Professor Asaph Hall, United States Navy, the chief of the party of American observers stationed at Vladivostok to witness the transit of Venus, arrived in Washington last evening. He was naturally fatigued by his long journey, but contented himself with one night's rest, and this morning very cheerfully gave the HERALD representative a three hours' sitting in his house in Georgetown. He detailed his experiences with much exactness, using his diary as a guide. As he is the only one of the Professors of the Naval Observatory who has returned his story possesses especial interest.

THE VOYAGE OF THE SCIENTIFIC ARMY.

The party of which the Professor was chief arrived at the port of Nagasaki (Nippon) on the 31st of August, in excellent health and spirits. Their voyage across the Pacific Ocean had been as expeditious and agreeable as could have been desired, while, upon examination, their instruments were found, with a few trifling exceptions, to be in perfect order. But three days were consumed in transferring their equipments to the United States steamer Kearsarge, which they found in waiting, and on the 3d of September they again set sail for Vladivostok. Captain Harmony, of the Kearsarge, devoted his entire energies to the success of the undertaking, and a swift and delightful passage of the 700 miles that separate Nagasaki from the Korean coast was the result. The harbor of Vladivostok was entered on the evening of the 5th. The little city was enjoying one of its frequent festival seasons and no landing was effected until the day following. Then Professor Hall and Captain Harmony went ashore and, although the holiday was not yet ended, obtained from the Chief of Police permission to remain. After considerable search five rooms in the log house occupied by the Mayor of the city, Mr. Federoff, were rented and arrangements for boarding the party completed. Professor Hall took up quarters with an old Danish captain named Devries, who boasted the desirable luxury of an American wife.

ENGINEERING FOR A FAVORABLE POSITION.

On the 11th the whole party went ashore and selected a site for an observatory in the southwestern portion of the city, on a point of land between the harbor and Amour Bay. The next day the work of constructing the necessary buildings began. A brief survey convinced the astronomers that they had fallen into a region of country desirable alike for a residence and for the museum on which they were engaged. The city of Vladivostok is unexceptionably located. It occupies a narrow strip of plain, forming the shore of a charming bay, and is protected at the rear by a range of lofty hills. The air is clear and exhilarating, the temperature being very like that of the State of Minnesota. The thermometer seldom rises above sixty degrees Fahrenheit, even in summer. A plentiful growth of oak and pine timber on the hillside furnishes an abundance of building material and fuel, while the fertile soil yields largely of vegetables, and many kinds of game and fish thrive unmolested for lack of demand. Flour and butter alone are imported. These are purchased in the San Francisco market. The city proper is little more than a naval station. Its population scarcely exceeds 4,000 souls, all of whom, except some 300 disreputable women sent thither in exile, are rulers, traders, sailors and coolies. Of the class first named there is a superabundance. The chief officer is the Governor, who is appointed by the Russian government, and is somewhat pretentious. Ranking below the Governor's staff is the Mayor, who lives a very humble way and possesses little power. The executive is the Chief of Police, who is charged with the maintenance of the peace and enjoys almost absolute control of the people. Two Yankees, named Smith, control the traffic of the place, one of them being quite wealthy and employing several hundred men. The coolies are divided into Chinamen and Koreans and live in a condition but little better than slavery.

TRACES OF AN ANCIENT CIVILIZATION.

The region is rich in evidences of a former civilization. Half worked gold mines and relics of ancient cities are abundant in the surrounding wilderness. These indicate with certainty the fact that at some remote period the country was peopled by an intelligent and thrifty race. A telegraphic cable, controlled by a Danish corporation, connects Vladivostok with Nagasaki, and runs thence southward along the coast line to Hong Kong and Singapore. A land line, owned by the Russian authorities, extends north and west to St. Petersburg.

BARBARIAN AID TO THE ASTRONOMERS.

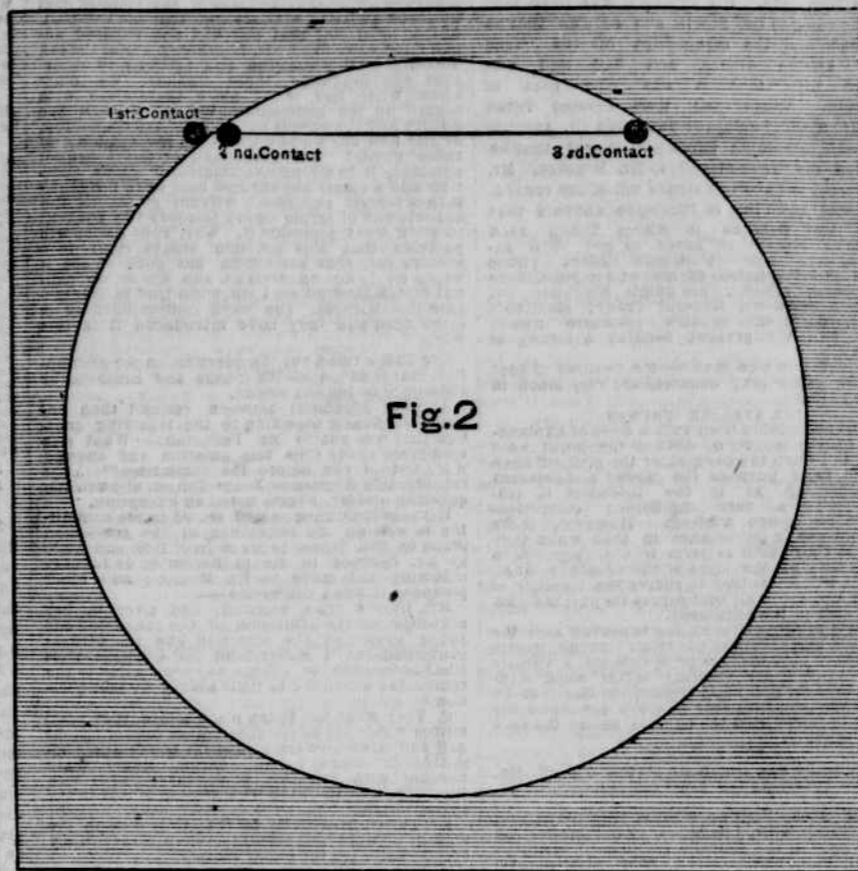
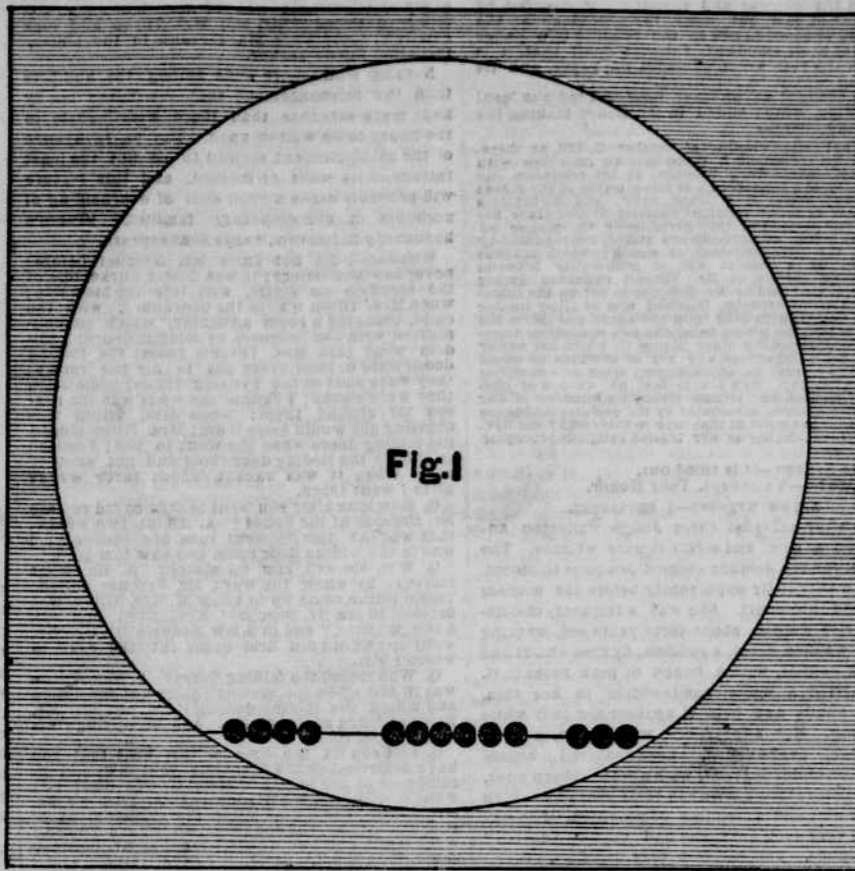
As soon as Professor Hall's party, consisting of Professor Hall, chief; O. B. Wheeler, assistant astronomer; W. F. Gardner, instrument maker; D. R. Clark, chief photographer, and T. S. Tappan, G. T. Rockwell and F. M. Lacey, assistant photographers, had fairly begun work upon their observatory, they found it necessary to employ a half dozen coolies, and to the supervision of these the scientific force found it necessary to bend its best energies. After many trying experiences the Professor learned the Korean phrase, "shangoo" (all right), and "poo shangoo" (all wrong), and by the skilful use of these managed to complete the task. Although the coolies were paid but half a ruble a day, they toiled so intently that the work cost quite as much as if done in this country. The transit house was finished with strong piers of Chinese tiles, well embedded in excellent clay and gravel ground, soon after the middle of September, and the force was then set at work building the piers for the photographic house. A violent rain delayed them a few days, but on the 25th they were gratified by the sight of a second structure ready for the instruments. A day or two afterward the house for the equatorial was also ready. All of the buildings were then banked about with earth to protect them against the violent northwest winds prevailing in the section; the roof of the equatorial house was tied down with strong cords and outer walls were raised about the photographic and clock houses, the intervening space being filled with sawdust. The whole was fenced in. A Russian stove was erected between the clock and photographic houses, and by the middle of October the observatory was complete. The cable company very kindly offered free use of their wires, and Mr. Hansen, resident manager, not only supplied all necessary accommodations, but exerted himself to aid the enterprise as to win the gratitude of everyone. Professor Hall built a line to the end of the cable, Mr. Hansen furnishing insulators and a battery.

BATTLING WITH ELEMENTAL DIFFICULTIES.

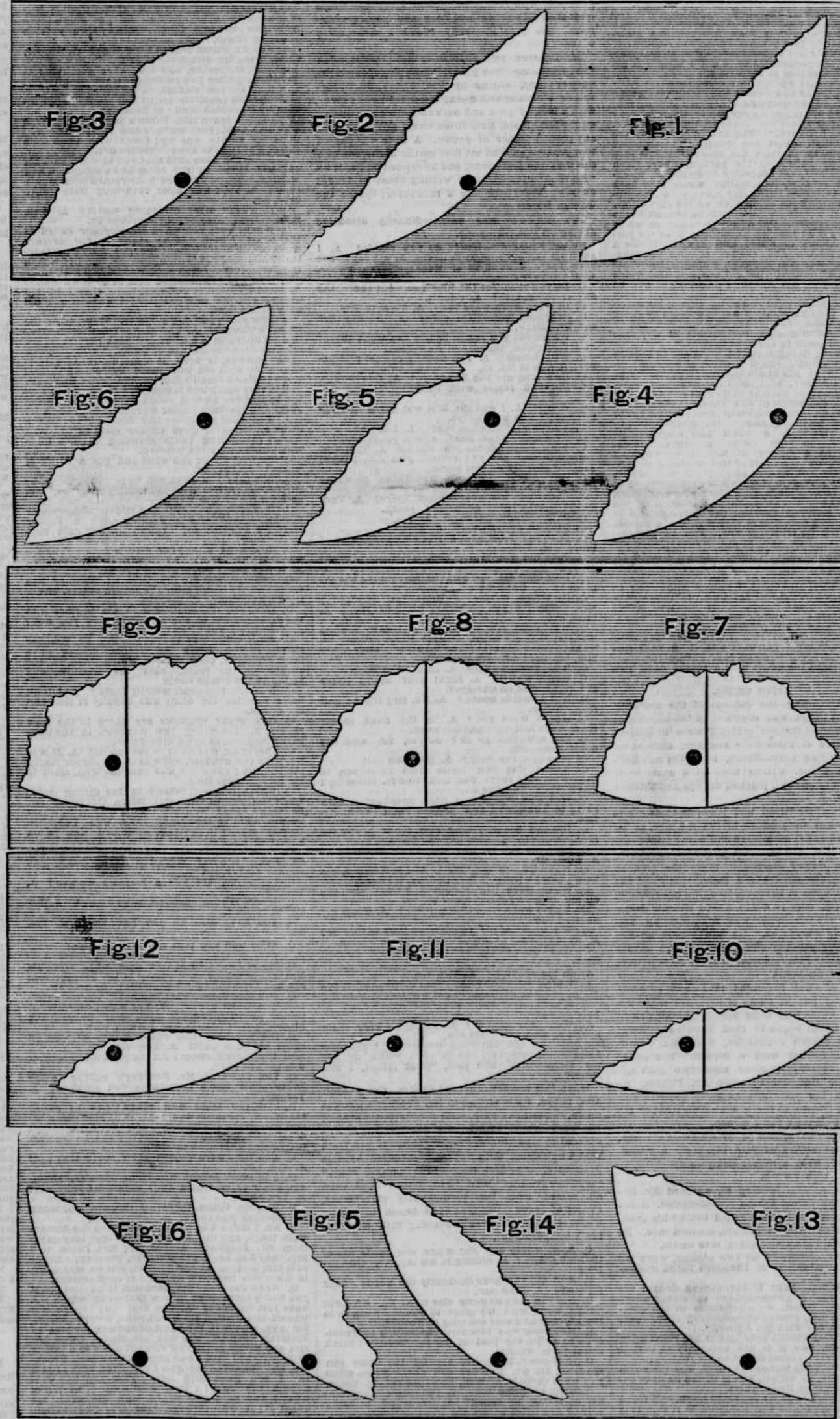
But one circumstance—the frequent violent storms of wind and rain—interfered materially

## VENUS CROSSING THE SUN.

The Planet's Track as Observed by Professor Hall's Party at Vladivostok.



Segment Photographs of the Sun During the Transit.



with the work. These were periodical and could be predicted with certainty by one acquainted with the country. A warm wind from the Japan sea, with rising thermometer, was sure to be followed by a storm from the northwest. The wind would suddenly shift square about, the weather turn cold, and a fierce, blinding tempest of rain set in. Such an event occurred on the 28th of October, when a telegram from Professor Davidson, at Nagasaki, announced his readiness to begin taking longitudes. Two or three days' delay was occasioned, but a fortnight of splendid weather followed, and was employed to advantage. Professor Davidson formed telegraphic connection with Nagasaki and Tokyo, and between Tokyo and Europe, the Russian government, through Mr. Dipner, its chief of telegraph stations, furnishing wire and insulators. Success attended every effort, and by the 10th of November the desired longitudes were ascertained and the wires taken down and returned to the owners. The work of testing the photographic apparatus was then taken up. A number of very fine pictures of the sun at different altitudes were

secured and many imperfections in the chemicals discovered and remedied. One difficulty was insurmountable.

EMBARRASSMENT OF THE PHOTOGRAPHERS.

It was necessary to keep the photographic room warm to preserve the chemicals, while the air without was cold. The thermometer inside showed sixty degrees Fahrenheit, and that outside twenty degrees. To obtain a view of the sun a slit in the roof must be opened, and the disturbance of the atmosphere thus caused obscured the light. But two alternatives were presented—viz., to give a long exposure and procure a blurred picture, or short exposure and a sharp but faint picture. Neither kind was desirable for exact measurements, but the latter was adopted with indifferent success. The two weeks preceding the transit were very busy ones. Some days were devoted to the last essential labor, that of obtaining the local time and latitudes by means of a theodolite. This being satisfactory everything was put in order, and the looked-for day found the party in perfect readiness for careful and successful observations of the transit.

THE TRANSIT DAY AT HAND.

For six days the weather had been delightful and the morning broke clear and cold. The chemicals were tested for a last time and found in excellent condition. Everything gave promise of success when, between seven and eight o'clock, the air grew warmer and the sky hazy. A stiff breeze set in from the southeast and gave certain promise of an approaching storm. Notwithstanding their fears, however, the astronomers and photographers took their positions and received the signal to begin. Professor Hall was at the large equatorial to take time with Mr. Gardner as assistant. Professor Wheeler commanded the small equatorial to observe the first and second contacts. The photographers were at their instruments. Mr. Gardner was instructed to leave the equatorial as soon as the first and second contacts were secured and go to the heliostat, his place at the telescope to be supplied by Lieutenant Morong, of the Kearsarge, who was pressed in for the occasion.

SUCCESSFUL IN THE MOMENTOUS OBSERVATIONS.

In observing the first and second contacts Pro-

fessors Hall and Wheeler were entirely successful. The image of the sun was very steady. The vibration experienced on cold days was absent, the haze and warmth conducing to steady the image. The photographers, however, were making bad work of their part of the programme. They had prepared for a clear day and arranged to take a picture every two minutes. They were, therefore, in no condition to cope with the exigencies of the situation. With a plain glass lens it was found impossible to secure sufficient light to photograph the contacts. It was discovered, when too late, that a silvered mirror was essential. Although Professors Hall and Wheeler could see the sun and Venus distinctly through their telescopes, the photographers failed to obtain a single perfect view of the contacts or one that could be made available in any way. It was not until Professor Hall entered the room and made several hasty changes that the apparatus was rendered serviceable. The plates had been prepared for a clear day, and, having failed at first exposure, were permitted to remain unused in the instrument. As a consequence some delay was caused in preparing new plates; but when they were done the work progressed without difficulty. While Venus was upon the sun's disk thirteen excellent photographs (shown in diagram 2) were obtained.

MEASUREMENTS OF CUSPS IMPRACTICABLE.

Professor Hall found it impossible to measure cusps accurately on account of the scarcity of light, and as the day progressed and the atmosphere became denser the difficulty increased. Twenty-eight minutes after the first contact Professors Hall and Wheeler made satisfactory observations of the second contact. Then the sky became clearer, and a large number of photographs, thirteen being (as remarked above) as perfect as could be wished, were taken. At the time of the third contact the sky grew quite hazy, and the time was observed with some uncertainty. The clouds gathered rapidly, and the fourth contact was lost entirely.

SPECULATION AS TO THE RESULTS.

Notwithstanding the bad weather Professor Hall feels that the results are important and the observations a success. Much depends upon a solution of the problem whether photographs can be measured with the requisite accuracy. When it is remembered that the negatives must be brought many thousands of miles, through varied temperatures, to Washington and here subjected to measurements which must not vary from absolute accuracy one ten-thousandth of an inch, some idea of the delicacy of the undertaking can be obtained. Should the collision film shrink but in the least degree, the entire work is lost. In all tests hitherto made the pictures have failed to give satisfactory results, but with the improved apparatus used on this occasion Professor Hall hopes that all defects have been remedied and that the photographs will be found accurate. As not less than two-thirds of the amount of money used by the American expeditions was devoted to the photographic method, it will be seen that it is very desirable that Professor Hall's expectations should be verified. If they are, the advantage to be derived by the cause of science from the discovery is incalculable.

INGENUITY OF AMERICAN CHEMISTS.

The Professor is satisfied that the American apparatus for photographing is much superior to that used by European expeditions. The Europeans mount their instruments equatorially, thus obtaining more light, but what we lose in light is more than compensated by the exactness with which we get positions. The forty-foot horizontal telescope used by the Americans can be set with theoretical exactness. An image of the plumb line is photographed upon each plate. By means of this and the distance between the centres of the two objects, which can be measured, the position of Venus on the sun's disk may be fully determined.

A HASTY HOME RUN.

Professor Hall's party left Vladivostok on the 12th of December, lest the winter should set in and render it impossible to get the steamer out of the harbor. They put to Nagasaki, and there the party broke up. Messrs. Wheeler and Clarke are on their journey home by way of Europe; Messrs. Rockwell and Lacey will probably take up their residence as teachers in Japan; and Messrs. Gardner and Tappan come upon the next steamer. Professor Hall left Yokohama on the 9th of January, sailing in the Altina, a German steamer, chartered to supply the place of the ill-fated Japan. Throughout the expedition the party enjoyed excellent health and received the kindest treatment from all with whom they came in contact.

THE FOREIGN EXPEDITIONS IN ASIA—EASTERN ASTRONOMERS SUCCESSFUL ALONG THE LINE.

Of the foreign expeditions in the vicinity of Vladivostok, Professor Hall brings reports as follows:—

At Vladivostok the Russian party under Lieutenant Onazawitch observed the first, second and third contacts; took no photographs, but made excellent measurements of cusps with a filar micrometer.

The Russian party under Dr. Glasevich were stationed near Lake Hanka, and obtained partial observations with a heliometer.

At Port Nakhodka, sixty miles northeast of Vladivostok, Lieutenant Shubru was stationed, and he had made no report.

At Possiet, Struve and Haseberg observed the first and second contacts and took photographs. The party at Nerchinsk, on the mountains, used a heliometer, had a fine day and were entirely successful.

At Hakodadi the weather was fair and three contacts were observed.

The Dutch party at Cheloo, under Dr. Valen-

thier, made complete heliometric and photographic observations.

At nearly all of the stations on the coast the weather was partially cloudy.

EXPLANATION OF THE DIAGRAMS.

The first of the accompanying engravings shows two pictures of the sun (figures 1 and 2). Figure

1 of this diagram exhibits the great luminary, with the track of the planet, as it was seen by Professor Hall and by all the astro-omera located on the northern hemisphere of the earth. The three spots on the track represent Venus in three of the most important stages of her transit. The first contact took place at the northeast edge of the sun's rim, when both bodies seemed to gently collide. The instant of time at which this apparent collision took place is of momentous importance. It was recorded by Professor Hall's party. As the planet advanced in its westward course it soon encroached on the sun's face until the left hand portions of both bodies barely touched at parting, which was the moment of second contact, and was also signalled by the Americans. After more than four hours the northwestern edges of both planets seemed to touch each other. This was the third contact, the precise moment of which was not ascertained (though it may yet be determined by calculation). The fourth contact was not seen by Professor Hall owing to the cloud drifts that swept all out of view. Figure 1 adjoining, in diagram one, portrays the sun's image as it was formed by the objective or lens in the photographic camera. The upper edge of the sun appears at the bottom in this figure, and the right portion of the sun's rim is now at the left, since objects are always reversed by a photographic lens. In consequence of this reversal the planet in all the succeeding engravings appears at the lower region of the sun, with a motion from right to left, the very contrary to its actual movement and appearance as seen from northern and equatorial climes. On the right extreme of the passage line, three minute circles depict the planet's appearance at three different periods subsequent to the observation of the first contacts. Further on when the transit is half accomplished, six more spots show Venus in six new positions, and toward the declining period of the phenomenon four tiny specks indicate a corresponding number of pictures taken by the photographers at that time.

ECONOMICAL DEVICES OF THE SCIENTISTS.

As it would be highly inconvenient and unnecessary to photograph the entire image of the sun, as in figure 1 of the first diagram, the astronomers adopted the plan of taking pictures of only that portion of the luminary wherein Venus appeared. Hence the photographs taken by Professor Hall's party are all of segments of the sun. The sixteen representations in the second diagram illustrate this with perfect accuracy. The segments therein portrayed are exact fac similes of those taken by the Americans in Siberia.

THE SEGMENT IMAGES.

The first three of these cuts represent the sun as it appeared to Professor Hall at the times of the first and second contacts. In figure 1 is shown a slight indentation upon the right limb of the sun, the first indication of the approaching transit. Venus gradually advanced until finally the only connection between the limbs of the sun and the planet was a slight filament shown in figure 2. This filament soon broke and Venus was entering upon the sun's disk (Fig. 3).

The remaining cuts are subdivisions of 13 of the photographs taken. Great advantage will result from the fact that three of these were obtained near the beginning, six near the middle and four toward the close of transit. The vertical line seen in the figures from 7 to 12 represents the projection of the plumb-line which was suspended near the objective, in order that it might be photographed simultaneously with Venus, and the position of the sun and planet relative to the horizon and zenith of Vladivostok thereby determined. The segment photographs are to be scrutinized in the order in which they are numbered, whereupon the position of Venus' track can readily be perceived and the transit in its various stages thoroughly understood. To an observer at the South Pole of the earth, viewing the transit without any instruments, Venus would appear crossing the sun precisely as the segment photographs indicate, because to him (whose feet would point almost toward ours) all the transit phenomena would be reversed, as they are in the photographs.

RAPID TRANSIT.

ORGANIZATION OF WARD CLUBS—THE DIVERSITY OF SENTIMENT.

That which now agitates the minds of men who have taken up the matter of providing this city with a rapid transit railway is the question, "In what way can the minds of our legislators be affected so that they will pass amendments to the General Railroad law?" As has been said before in the HERALD the general and immediate answer to this question is to the effect that rapid transit clubs, organized in each ward, would convey to the legislators at Albany the sense that New York needs rapid transit and must have it, else there will be thoughts stored up by the people of the metropolis that will cause trouble in the future to Assemblymen and Senators who now lack foresight and discretion. But there is a difficulty connected with the organization of ward clubs that, if not overcome, will prevent them from working out a good result. They may not agree as to what party ought to be authorized to build a rapid transit railway. Already there is contention upon this subject. If there are two sets of ward clubs organized, one connected with the central organization of subscribers to the "deferred capital" fund, and the other supporting the proposition for the city to build the rapid transit railway, there will be a chance for venal legislators to vote against every measure for rapid transit presented at Albany and yet escape the censure of the combined public. It is apparent, then, that the adherents of the two ideas must be harmonized. One of the other project must "go to the wall."

It does not seem to have struck the minds of the members of either set that they should procure the opinions of eminent legal authorities to make firm or throw down the foundations of their opinions. Each party goes on making its preparations for encounters in the legislative hall, when they might arrange all their differences of opinion in this city and go to Albany in solid phalanx, and overthrow all opposition there to rapid transit. Mr. C. H. Roosevelt, Secretary of the "Citizens' Movement," has already called upon the holders of subscription receipts for copies of the sums pledged upon those papers. This is a preliminary to the calling together of all subscribers to form a central organization. As soon as this body is organized the members of it will be requested to form clubs in their wards. When the clubs are started to advocate the construction of a railway by the city; and there are said to be movements on foot to organize such clubs, there will be danger of a continual clashing between the rival bodies. No illustration is needed to convey to the minds of the people the fact that such an event will retard the accomplishment of rapid transit.

The Special Committee on Rapid Transit of the Board held an executive meeting yesterday, in order to decide upon the report they are to make to the Board. Without taking any action the committee adjourned, to meet again on Friday.

THE LIQUOR DEALERS' DISPUTE.

HEADQUARTERS NEW YORK LIQUOR DEALERS' PROTECTIVE UNION, MASONIC HALL, EAST THIRTIETH STREET, FEB. 16, 1875.

To the EDITOR OF THE HERALD:—

Having received a notice purporting to emanate from the New York Liquor Dealers' Protective Union, that a meeting was to be held at Putnam Hall on Monday evening, February 15, and thinking that the same was a duly authorized notice from the Executive Committee of that body, I proceeded thereto and found a number of liquor dealers present. As one of the Vice Presidents of the union, I was, in the absence of the President, Mr. Aaron Herzberg, called to the chair, when a motion was made to elect me President of the union, an honor which I declined on the grounds that there was no vacancy in that position and the motion was in conflict with the constitution and by-laws. I wish to state that the meeting was a legal one, never having been authorized, that I attended it against all its proceedings, that I do not recognize or countenance its action, and I advise the liquor dealers of this county to remain steadfast to the union which has been and is working energetically for their interests and the betterment of the community.

MARK LAMMAN.

THE WEATHER YESTERDAY.

The following record will show the changes in the temperature during the past twenty-four hours, in comparison with the corresponding date of last year, as recorded at Hudson's Pharmacy, Herald Building, New York:—

1874.	1875.
3 A. M. .... 33	7 33.0 P. M. .... 48
9 A. M. .... 37	1 10 P. M. .... 50
3 P. M. .... 57	10 10 P. M. .... 57
12 M. .... 40	15 12 P. M. .... 34
Average (twenty-four hours) .....	47.5
Same date of last year .....	40.5